FOXE BASIN POLAR BEAR
RESEARCH PROGRAM
1986 FIELD REPORT

Northwest Territories Resources, Wildlife & Economic Development

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ABSTRACT

In 1986, the Foxe Basin Polar Bear Research Program was redesigned in an attempt to avoid some of the problems of the traditional mark-recapture technique. The past two years of field work on Southampton Island have shown that both the fall weather conditions and the inaccessibility of some polar bears (Ursus maritimus) precludes capturing a sample large and representative enough to be used for a population estimate.

Two field crews surveyed the majority of the Foxe Basin and northern Hudson Bay coastlines. A total of 278 polar bears were observed. Of this total, 210 were seen in northern Hudson Bay (mainland coast between Wager Bay and Chesterfield Inlet, Wager Bay, Repulse Bay area, and Southampton Island). Twenty-nine polar bears were instrumented with radio transmitters, throughout the study area, in an effort to determine population discreteness. To date, no survey flights have been flown to relocate any of these collars. Forty polar bears were captured near Churchill, Manitoba in an effort to evaluate tetracycline as an alternative mark-recapture technique. Tetracycline binds with calcium and leaves a permanent mark in bones and teeth. This mark is visible under ultra-violet light. Teeth extracted from bears injected with tetracycline will be sectioned and viewed for the presence or absence of the mark in the spring of 1987.

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INTRODUCTION

Since 1977, the Inuit living in the northern Hudson Bay and Foxe Basin settlements (Fig. 1) of the Northwest Territories (NWT) have made formal requests to the Territorial Government for increases in their polar bear quotas. However, as there were no population estimates for polar bears in this area (Stirling and Ramsay 1986), few quota adjustments have been made. A cooperative research agreement was proposed that would have seen the federal, territorial, and four provincial governments fund and actively participate in a large scale polar bear project encompassing all of James Bay, Hudson Bay, Hudson Strait, and Foxe Basin. However, due to cutbacks at all levels of government, the research agreement was never signed. In 1984, the Department of Renewable Resources, Government of the NWT, initiated a mark-recapture program on Southampton and Coats islands. Stenhouse and Lunn (In prep.) and Lunn and Stenhouse (In prep.) summarized the results of the work conducted in 1984 and 1985, respectively.

In 1986, the Department of Renewable Resources re-evaluated the Foxe Basin Polar Bear Project because: 1) without the research agreement, the NWT would have to expand the study to include all of northern Hudson Bay, Hudson Strait, and Foxe Basin to be confident that the entire population was delineated; 2) traditional mark-recapture programs are expensive and it was unlikely that there would have been sufficient funds to continue the study (in its present form) over such a large area and come

up with a reliable population estimate; and 3) two years of work in this area have shown that both the weather conditions at this time of the year and the inaccessibility of some polar bears precludes capturing a sample large and representative enough to be used for a population estimate (Stirling and Ramsay 1986).

The project was redesigned in an attempt to avoid some of the problems of the traditional mark-recapture technique. Firstly, we plan to determine the discreteness of polar bear populations resident in this region. None of the 120 polar bears tagged, in Wager Bay, on Coats Island, and on Southampton Island over the past two years, has been reported killed by the Inuit hunters in either Igloolik or Hall Beach. This may suggest that there are at least two sub-populations of polar bears. To help determine population discreteness, radio transmitters will be deployed. Each year, four or five fixed-wing aerial surveys will be flown to relocate instrumented animals. Secondly, an alternative to traditional mark-recapture methods will be developed and evaluated.

Tetracycline, an antibiotic, binds with calcium and leaves a permanent mark in the bones and in the cementum annuli of the teeth. In sectioned teeth, this mark is visible under ultra-violet light. Therefore, tetracycline could be used as the mark; injecting it into polar bears from a helicopter. The recapture sample could then come from the annual harvest of 137 polar bears in this region. From this sample, the proportion of marked animals and the year of marking could then be determined by

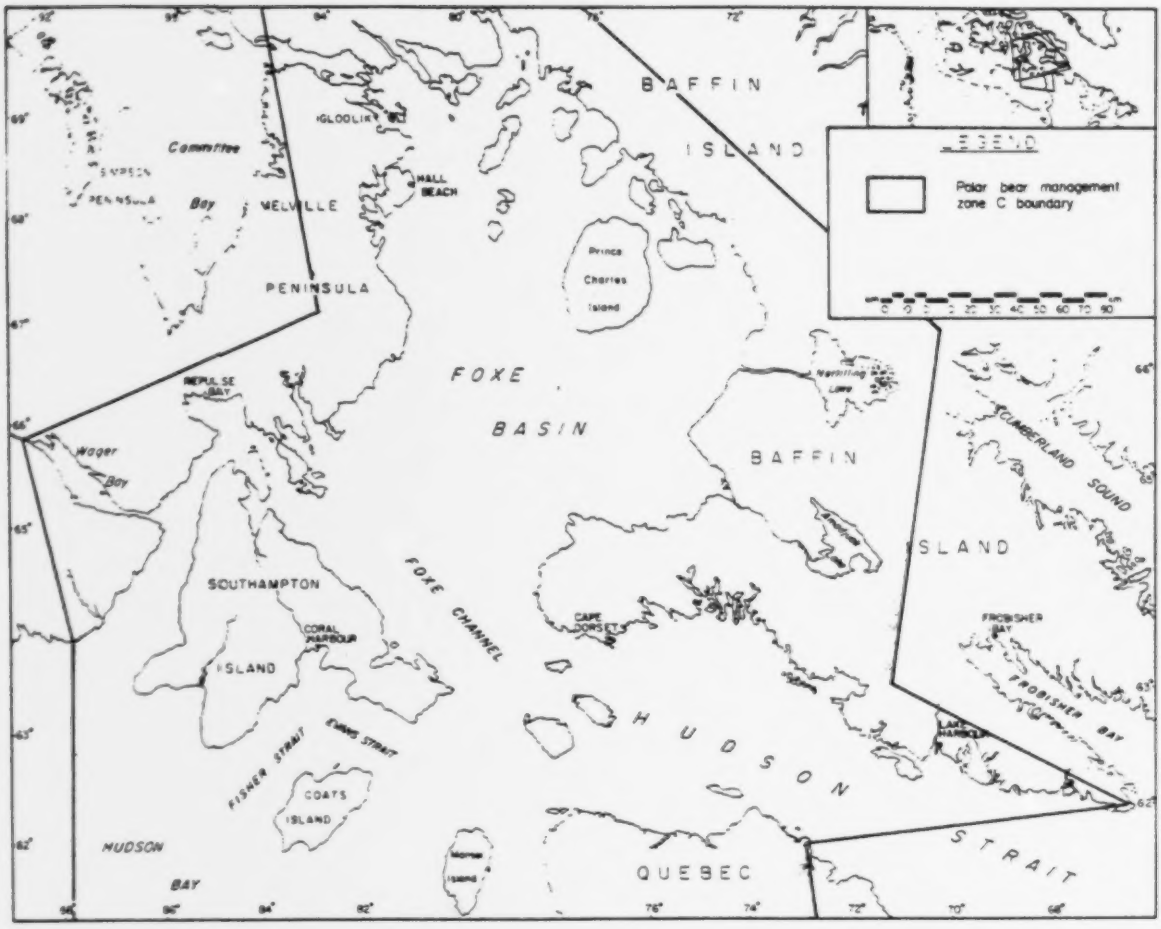

Figure 1. Locations of Inuit settlements within the northern Hudson Bay and Foxe Basin study area.

sectioning and aging each tooth (Ramsay and Andriashek 1986). Although the harvest is not random, the marking could be easily stratified.

The objectives of the 1986 field season were to:

1) instrument up to 38 polar bears with radio transmitters in an effort to determine population discreteness;
2) make a preliminary evaluation of the tetracycline system in a controlled situation; and
3) document the distribution and abundance of polar bears in northern Hudson Bay and Foxe Basin for the purpose of evaluating stratification during future marking.

This report summarizes the 1986 field season of the Foxe Basin Polar Bear Project.

METHODS

Two Bell 206B Jet Ranger helicopters were used to locate and capture polar bears. One machine worked in northern Hudson Bay (southern Melville Peninsula, Wager Bay, and Southampton Island), while the other machine worked in Foxe Basin. Wherever possible, bears were classified based on sex (male, female, or unknown) and on age class (adult, subadult, yearling cub, cub-of-the-year (COY), or unknown). Females were distinguished from males by general morphology and the presence of a pronounced stain below the anus and tail. Size and body morphology were the criteria used to separate polar bears into age classes. Cubs were readily identified as they were accompanied by an adult female. COYs were much smaller than yearling cubs. Bears that could not be classified were placed in the category "unknown".

Due to the conical shape of the head and neck of adult males, only adult females were selected for the attachment of radio collar transmitters (Appendix A). Once located, adult females were immobilized by injection from rifle-fired darts, with Zoletil 100 (Virbac Laboratories, Nice, Cedex, France) mixed to a concentration of 200 mg/ml. Zoletil 100 is made up of a 1:1 ratio of the drugs tiletamine hydrochloride and zolazepam hydrochloride. Stirling et al. (1980) and Ramsay and Andriashek (1986) described the tagging of polar bears. Adult females were fitted with radio transmitter collars (Telonics Inc., Mesa, Arizona, USA and Lotek Engineering Inc., Aurora, Ontario, Canada). Fixed-wing aerial surveys will be flown periodically

from January through August 1987 to relocate these instrumented bears. To determine whether females were pregnant, femoral blood was collected for later analysis of progesterone levels (Veterinary College, University of Saskatchewan, Saskatoon, Saskatchewan, Canada). Blood was only collected from bears in northern Hudson Bay.

Tests to evaluate the usefulness of tetracycline as a permanent marker were conducted from 23 October to 5 November in the area of Churchill, Manitoba. Polar bears were located and immobilized as described above. As these bears were not being equipped with radio collar transmitters, both males and females were available for capture. One of five different dosages (2 mg/kg, 4 mg/kg, 8 mg/kg, 15 mg/kg, or 25 mg/kg) of tetracycline was injected into one of two different locations (rump or neck/shoulder) to test for suitable dosages and locations for future use of tetracycline. To ensure that all 10 possible combinations of dosage and injection site were used, we systematically cycled through the dosages and alternated the injection site such that the first bear handled was injected with the first dose (2 mg/kg) in the first location (rump), the second bear handled was injected with the next dose (4 mg/kg) in the second location (neck/shoulder), and so on. When all 10 combinations had been used, we started over from the beginning dosage and injection location. All bears handled were put into one of the following categories:

Group 1 - captured in August/September, injected with tetracycline, marked for future identification, released (Stirling pers. comm.), and recaptured in October/November;

Group 2 - captured in October/November, injected with tetracycline, attachment of an ear-tag transmitter (Telonics Inc., Mesa, Arizona, USA), released, and recaptured 7 to 10 days later;

Group 3 - captured in October/November and released (control group).

Teeth were extracted, upon initial capture, from bears in all three groups. These teeth will be used as controls as tetracycline should be absent in all these teeth. Bears in groups 1 and 2, had a second tooth removed upon recapture. These teeth will be examined for the presence of tetracycline at the Ontario Ministry of Natural Resources's laboratory, Maple, Ontario and compared to the control teeth. Two different delay periods (Group 1 - at least 1 month and Group 2 - 7 to 10 days) before recapture and subsequent removal of second teeth were set up to determine if a minimum tetracycline binding time exists.

Blood samples (50 ml) were taken, upon recapture, from 15 bears injected with tetracycline and will be analyzed for any adverse effects of tetracycline. Analysis will be done by Dr. U. Seal, University of Minnesota. Blood taken from bears in group 3 will also be analyzed and used as controls.

RESULTS AND DISCUSSION

A total of 113 hours were flown in the study area from 13 September to 6 October, 60 hours in northern Hudson Bay and 53 hours in Foxe Basin. Table 1 summarizes the numbers of polar bears seen according to sex and age class. Seventy-five percent (210/278) of the bears seen in the entire study area were found in northern Hudson Bay. The number of bears seen there was not surprising as both Wager Bay (Donaldson et al. 1981, Lunn and Stenhouse In prep.) and Southampton Island (Lunn and Stenhouse In prep.) are known summer retreat areas for polar bears.

We did not know what to expect, in terms of numbers and distributions of polar bears in northern Foxe Basin as no polar bear research had been done there other than 16 bears tagged by Manning (1973). We found only two areas where bears appeared to concentrate: Rowley Island and Prince Charles Island. However, a concentration of 25 bears on Prince Charles Island was caused by their attraction to walrus carcasses on the west coast. Twenty-one bears were observed on southern Rowley Island. Of that total, 19 were adult males.

The low number of bears observed in Foxe Basin, compared to northern Hudson Bay, was most likely a result of a combination of the wind, ice, and ocean current patterns of this region. As the ice breaks up in the summer, northeasterly winds and the general counter-clockwise flow of the ocean currents tend to cause ice floes to concentrate along the northeast coast of Southampton Island (Harington 1968, Canada, Atmospheric Environment Service

Table 1. Numbers of polar bears seen or handled, by sex and age class, in northern Hudson Bay and Foxe Basin, 13 September - 6 October 1986.

	AM	AF	SM	SF	SU	YM	YF	YU	CM	CF	CU	U	Total
FB	34	14	0	0	2	3	1	2	1	1	10	0	68
NHB	70	39	19	1	25	3	1	12	2	5	20	13	210
	104	53	19	1	27	6	2	14	3	6	30	13	278

FB = Foxe Basin NHB = northern Hudson Bay

AM = adult males AF = adult females SM = subadult males
SF = subadult females SU = subadults unidentified
YM = yearling males YF = yearling females
YU = yearlings unidentified CM = COY males CF = COY females
CU = COY unidentified U = unidentified bears

1980-1984). This probably also explains the high number of polar bears observed on Southampton Island.

The observed adult sex ratio was approximately 2:1 in favor of males in both northern Hudson Bay (70 males, 39 females) and in Foxe Basin (34 males, 14 females). However, our surveys concentrated on the coastal areas. Other studies (Latour 1981, Lunn and Stirling 1985) have shown that in summer retreat areas, polar bears segregate. Adult males, and to a lesser extent subadult males, tend to be found in coastal areas. The known denning areas in Wager Bay and on Southampton Island were also not extensively searched. Therefore, it is likely that adult females are under-represented in our northern Hudson Bay sample. As we do not have any information on denning areas in Foxe Basin, we are unable to speculate whether the observed sex ratio there was an artifact of our survey or was an accurate representation. It is possible, due to the ice breakup patterns, that Southampton Island might be the major denning area for the entire northern Hudson Bay and Foxe Basin region.

Thirty-eight family groups were observed in northern Hudson Bay and Foxe Basin. The breakdown by litter size is summarized in Table 2.

Twenty-nine bears were immobilized and fitted with radio transmitters, 28 females and 1 subadult male. Of this total, 20 bears were caught in northern Hudson Bay while nine bears were caught in Foxe Basin (Fig. 2). The reasons for the unequal distribution of collars was a function of being able to locate

Table 2. Litter sizes of family groups observed in northern Hudson Bay and Foxe Basin, 13 September - 6 October 1986.

	COY LITTERS		YEARLING LITTERS	
	FB	NHB	FB	NHB
Singles	1	7	4	4
Twins	4	10	2	5
Triplets	1	0	0	0
Total	6	17	6	9

FB = Foxe Basin NHB = northern Hudson Bay

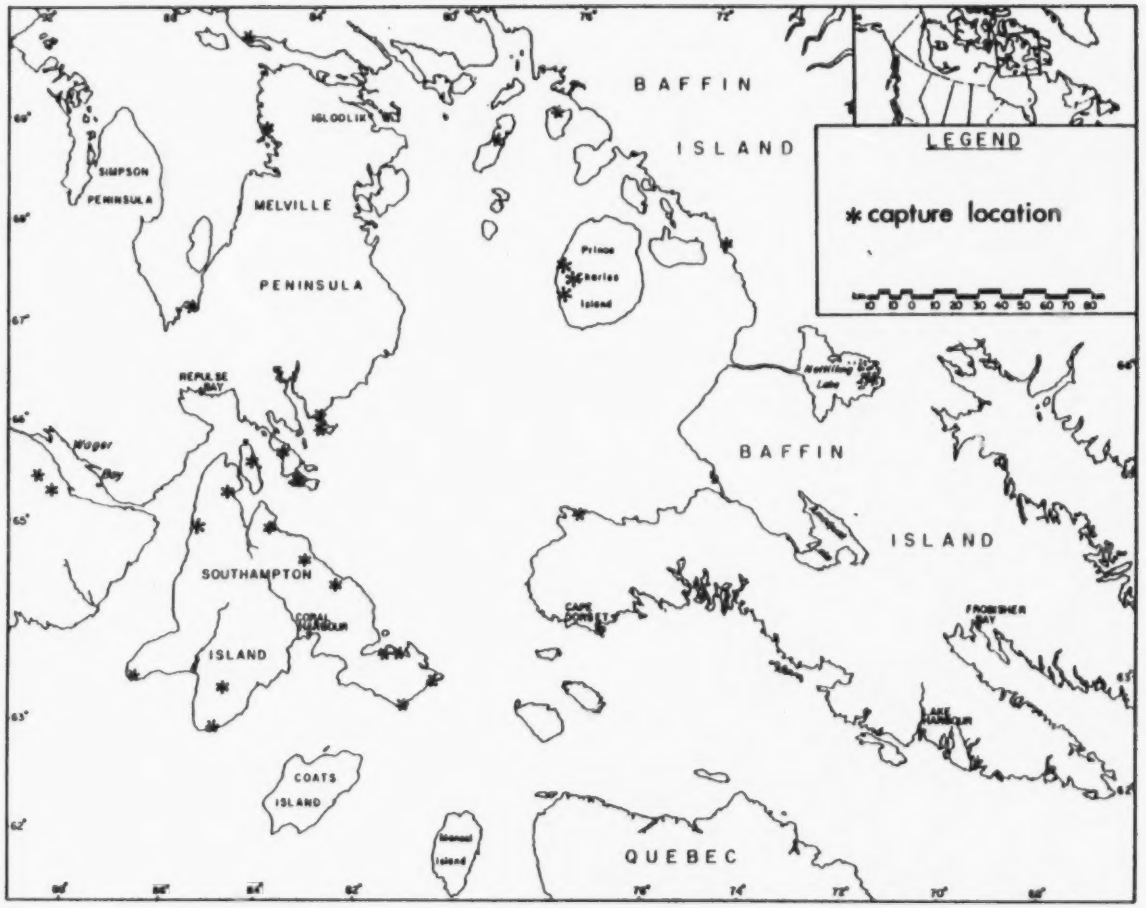

Figure 2. Locations of polar bears captured and equipped with radio collars within the study area.

females. To date no aerial survey flights have been flown to relocate the collars. There are plans to fly three telemetry surveys prior to August 1987.

A total of 40 polar bears were handled in the Churchill, Manitoba region (Appendix B). To date, the teeth have not been sectioned and examined for the presence or absence of the tetracycline mark. One bear died, apparently due to drug/capture related stress (Appendix C).

ACKNOWLEDGEMENTS

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The following individuals provided invaluable assistance throughout various stages of this work: D. Andriashek, R. Bourget, R. Hagen, S. Kearney, M. Labine, R. Mulders, G. Norrie, U. Seal, J. Shavigatta, M. Shoesmith, G. Stenhouse, I. Stirling, G. Tanner, R. Tease, and I. Thorleifson. K. Poole, G. Stenhouse, and A. Welch reviewed and edited the text.

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APPENDIX A. Polar Bears Fitted with Radio Transmitters.

Bear	Sex	Date	Location	Lat	Long	Freq. (MHz)	
X08826	F	13-09-86	Committee Bay	6722	08633	164.641	T
X08828	F	14-09-86	Wager Bay	6519	08931	164.161	T
X08830	F	14-09-86	Wager Bay	6533	08940	164.580	T
X08831	F	15-09-86	Winter I	6612	08303	164.960	T
X08832	F	15-09-86	Winter I	6614	08256	165.683	T
X13002	F	17-09-86	Rowley I	6900	07905	165.061	T
X13003	F	18-09-86	N of Hopkins Inl	6911	08520	164.722	L
X13004	M	18-09-86	C Appel, Agu Bay	7006	08615	165.151	T
X08835	F	18-09-86	Vansittart I	6555	08408	165.501	T
X08837	F	18-09-86	Vansittart I	6544	08357	165.852	T
X08838	F	18-09-86	White I	6549	08436	164.642	T
X08839	F	18-09-86	Thomsen R	6532	08522	164.912	T
X08841	F	19-09-86	Cape Low	6308	08509	164.702	L
X08843	F	19-09-86	The Points	6335	08502	164.411	T
X08844	F	19-09-86	Cape Kendall	6336	08714	164.691	L
X08845	F	20-09-86	Leyson Point	6326	08059	165.602	T
X08794	F	20-09-86	Expectation Pt	6343	08023	165.601	T
X05030	F	20-09-86	Bray I	6927	07715	164.671	L
X08847	F	21-09-86	Kokumiak Hbr	6452	08300	164.742	L
X08848	F	21-09-86	Cape Donovan	6444	08244	164.732	L
X08849	F	25-09-86	Murray R	6454	08607	164.712	L
X08850	F	25-09-86	Cape Comfort	6506	08347	164.012	T
X13008	F	25-09-86	Prince Charles I	6735	07715	165.571	T
X13010	F	26-09-86	Prince Charles I	6802	07700	164.652	L
X13011	F	26-09-86	Prince Charles I	6803	07658	165.871	T
X08851	F	26-09-86	Gore Point	6401	08119	164.781	T
X08852	F	26-09-86	M'Clure Point	6402	08115	164.791	T
X13014	F	28-09-86	Parry Point	6800	07350	165.261	T
X13015	F	29-09-86	Peregrine Point	6525	07650	165.171	T

T - Telonics Inc, Mesa, Arizona

L - Lotek Engineering Inc., Aurora, Ontario

APPENDIX B. Polar Bears Handled in the Churchill, Manitoba Region as part of the Tetracycline Program.

	Bear	Capture Date	Recapture Date	Age/Sex Class
GROUP 1	X09724	-	23-10-86	Adult M
	X09740	-	23-10-86	Adult M
	X10033	-	23-10-86	Adult M
	X10035	-	23-10-86	Adult M
	X10060	-	23-10-86	Adult M
	X09918	-	24-10-86	Adult M
	X10031	-	24-10-86	Subad M
	X10034	-	24-10-86	Adult M
	X10099	-	24-10-86	Adult M
	X10202	-	24-10-86	Subad F
	X09241	-	25-10-86	Adult M
	X09749	-	25-10-86	Subad M
	X10039	-	25-10-86	Subad M
	X10192	-	25-10-86	Subad M
	X09722	-	30-10-86	Adult M
	X09084	-	04-11-86	Adult M
	X09271	-	04-11-86	Adult M
	X05678	-	05-11-86	2 Yr F
	X10082	-	05-11-86	Adult M
	X10084	-	05-11-86	Adult M
GROUP 2	X09757	23-10-86	04-11-86	Adult M
	X13017	23-10-86	30-10-86	Adult M
	X13018	23-10-86	30-10-86	Adult M
	X05594	24-10-86	31-10-86	Adult M
	X09281	24-10-86	31-10-86	Adult M
	X09647	24-10-86	30-10-86	Adult M
	X09761	24-10-86	30-10-86	Subad M
	X13019	24-10-86	30-10-86	Adult M
	X13024	24-10-86	04-11-86	Adult M
	X09240	25-10-86	30-10-86	Adult M
	X09669	25-10-86	04-11-86	Adult M
	X10210	25-10-86	30-10-86	Adult M
	X13020	25-10-86	30-10-86	Adult M
	X13022	25-10-86	30-10-86	Adult M
GROUP 3	X13026	04-11-86	-	Adult M
	X13027	04-11-86	-	Adult M
	X13028	04-11-86	-	Adult M
	X13029	04-11-86	-	Adult M
	X16048	04-11-86	-	Subad M
	X09287	05-11-86	-	Adult M

Group 1 - tetracycline, 1 month delay
Group 2 - tetracycline, 7 to 10 day delay
Group 3 - control group

APPENDIX C. Report of Handling Death, Churchill, Manitoba.

MANITOBA
DEPARTMENT OF NATURAL RESOURCES

OFFICER'S REPORT

Region	District	Officer	Date
North East	Churchill	Mitchell Taylor	86 (Y/R) 11 (M/O) 06 (D/Y)

SUBJECT: Report on Capture Death of Polar Bear X10084 (EP)

This adult male polar bear had been captured for the first time during autumn (September) 1986 by Dr. Ian Stirlings research group. The initial immobilization was with Tolezole. Dr. Stirlings group injected bear X10084 with 15 mg/kg of Tetracycline as part of the study with NWT on the use of this compound as a long-term biomarker. The bear was recaptured to determine if the tetracycline had been taken up and retained by the teeth.

The bear was sighted from the helicopter by the NWT group on 05/11/86. The bear was identified by the letters "EP" painted with Nyanaza dye on the bears left flank. Those present in the second capture were Dr. Mitchell Taylor, NWT Wildlife Service; Dr. Ulysses S. Seal, University of Minnesota; Ms. Mary Alice Seal; and Mr. Mark Hutchinson, pilot. The bear was sighted at 11:57 and darted at 11:59 after a 1 minute pursuit.

The 10 ml dart with a 1°1/4 inch barbed needle contained 700 mg Sernylana and 300 mg Rompun. The dart was fired with a green charge and stuck in the left shoulder.

At 12:04 the bear laid down in a willow marsh, was approached by the helicopter and moved away from possible water underneath the snow. The bear traveled to higher ground and went down again at 12:14. The helicopter landed behind the bear at 12:20 and the bear was observed to be sternal, but with head up and responsive. The bear was sufficiently alert and mobile that a second injection of 250mg Serylan had to be administered in the muscle of the back at 12:27. The drug was delivered by hand syringe.

The bear's head dropped at 12:32 and we began working and measuring the bear at 12:34. The upper right premolar was extracted at 12:36, 25 cc of blood was taken from the right femoral vein at 12:39, and chest girth (321kg) was taken at 12:40. The bear convulsed at 12:47, 12:48, 12:51, and 12:54. Valium, 15mg, was given at 12:48. Respiration dropped to approximately 2 per minute at 12:57, so artificial respiration was begun and good air exchange was achieved. The bear immediately resumed respiration at 4 - 6 breaths per minute.

However, heart action was observed to cease at about 1300. Yohimbine (20mg) was given immediately I.V. in the femoral vein and respiratory support was maintained for 15 minutes. The corneal reflex had disappeared by 13:03 and no cardiac response was observed from the time of it's initial disappearance.

A field autopsy was performed. No gross pathology was noted in the liver, kidneys, lung or heart. Fecal material was noted in the large intestine and the stomach contained solid material. Twenty-five cc of urine was recovered from the bladder.

The cause of death is presumed to be drug/capture related cardiac arrest.

Mitchell Taylor,
Renewable Resources, Government of NWT

MT/dm

MG-6140
SM - 08/83

DISTRICT